The pathology of the disease in chamois is similar to the type description of periodontitis complex in man. In periodontitis simplex, bone is resorbed at an even rate around each tooth throughout the mouth and pockets are of even depth. In periodontitis complex, bone is resorbed unevenly in relation to individual teeth (Box 1921). Thus, pocket formation was localised and uneven in the alveolar tissues and around the infected tooth or teeth (see Fig. 1), and usually involved the first molar in both sexes. It was followed, in the early phases of alveolar ostitis by enlargement and deepening of the alveolus and accumulation of foreign matter. In the final phase loss of the tooth occurred.

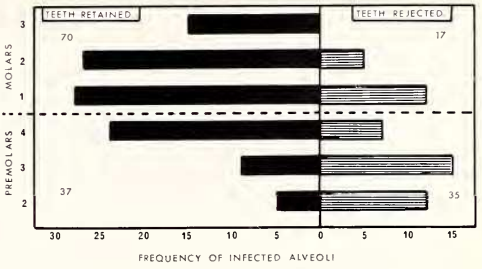


*Fig. 2*

## Discussion

The frequency of animals infected by paradontal disease reported in this study is almost certainly an underestimate. This is because the primary marginal gingivitis phase could not be detected in the jaws of this sample; furthermore the study was restricted to molariform teeth in the lower right-hand jaws only. In several of these jaws molars were observed with abnormally elongated cusps, indicating an obvious gap in the maxillary toothrow.

There was no significant difference between the condition indices of diseased and healthy chamois in the sample studied. However, the extent of the damage caused to the alveoli of molars during the periodontitis and alveolar ostitis phases (see Figs. 1a, b, c and d) strongly suggests that animals affected by these later phases of paradontal disease were in the process of losing condition or would have lost condition. It is reasonable to assume that irritation during mastication causes reduced ingestion with a consequent lowering of the general condition. This assumption is supported by evidence given by MacKinnon (1959), and other reports published by Thompson (1906), Anon (1944), Murie (1944), Colyer (1947) and Coolidge and Hine (1958). However, the fact that some animals did survive the disease, although with a reduced dentition (see Fig. 1f) indicates that infection with paradontal disease is not necessarily fatal.

MacKinnon (1959) found no evidence in sheep of any generalised or other systemic disease (particularly of bone), and only the changes normally associated with falling condition and reduced intake of food. He also reported that in other cases of paradontal disease in sheep, he frequently observed the final healing phase after premolars had been rejected, but in the case of molars the animals usually had died or had been culled in an emaciated state before the repair process was complete. Rudge (1970) states however that in a population of feral goats on Macauley Island, Kermadec group, "the impact (of paradontal disease) on survival is not known but it probably was very slight, although it would certainly have been painful and affect chewing ability as age advanced".

Niethammer (1971) examined a sample of chamois skulls from New Zealand and concluded that both sexes show a greater dental variability than their ancestral Styrian counterparts. However, despite the fact that he observed symptoms associated with the later stages of paradontal disease, he did not consider that some of this

apparent variability (i. e. anomalies such as missing teeth, see Fig. 1f) could be the result of a pathological condition, such as paradontal disease.

He further states that chamois teeth generally, appear to be exposed to heavier wear in New Zealand than in Styria. It is possible that the harder more fibrous nature of the vegetation occurring in the New Zealand alpine pastures has contributed significantly to faster attrition. This may also account for the relatively high frequency of animals affected by paradontal disease.

I have observed symptoms identical to those described in this report in red deer, fallow deer, sika deer and wapiti *(Cervus elaphus canadensis)*. However in these cervids teeth seldom appear to be rejected, probably because of their larger size and sturdier root system. In the opossum (*Trichosurus vulpecula* Kerr) the symptoms of paradontal disease were also apparent.

Poole and Newman (1971) state that diseases of the teeth and their supporting structures are more widespread in man than any other disease, and that paradontal disease is the principal cause of tooth loss. Evidence presented in this report indicates that this disease is probably more widespread in mammals than has generally been realised.

## Summary

Suspected anomalies in the teeth of chamois were related to successive phases of paradontal disease. These phases were isolated in 20 % of a sample of 274 mature chamois mandibles of both sexes.

Permanent teeth with the longest occlusal stress were the first to be affected by the disease, they were not first to be rejected however. This appeared to be correlated with the morphology of the root system.

No significant difference in general condition could be detected between healthy and infected animals as determined from the kidney-fat-index and the weight of the kidney alone, although means of diseased animals were consistently lower.

The proportion of diseased animals increased with age in both sexes.

## Zusammenfassung

*Paradontale Erkrankungen als Ursache von Zahnverlust in einer Population von Gemsen in Neu-Seeland*

Unregelmäßigkeiten im Gebiß neuseeländischer Gemsen wurden in bezug auf aufeinanderfolgende Phasen von paradontalen Erkrankungen gegliedert.

Verschiedene dieser Phasen wurden in 20 % einer Stichprobe von 274 voll ausgewachsenen Unterkiefern festgestellt.

Die Dauerzähne mit der zeitlich längsten okklusalen Belastung wurden von der Erkrankung zuerst ergriffen. Sie wurden aber nicht als erste abgestoßen, da diese Erscheinung sich eher auf den morphologischen Bau der Zahnwurzeln beziehen ließ.

Der allgemeine Zustand der gesunden und befallenen Tiere wurde durch das 'Nieren-Fett'-Verhältnis und das Nierengewicht beurteilt. Diese zeigten aber keinen gesicherten Unterschied, obwohl die Mittelwerte der befallenen Tiere etwas niedriger lagen.

Der Anteil befallener Tiere nahm in beiden Geschlechtern mit dem Alter zu.

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